Experiments with JupyterHub at the Saint Petersburg State University

Andrey EROKHIN*, Andrey ZAROCHENTSEV

*st016885@student.spbu.ru

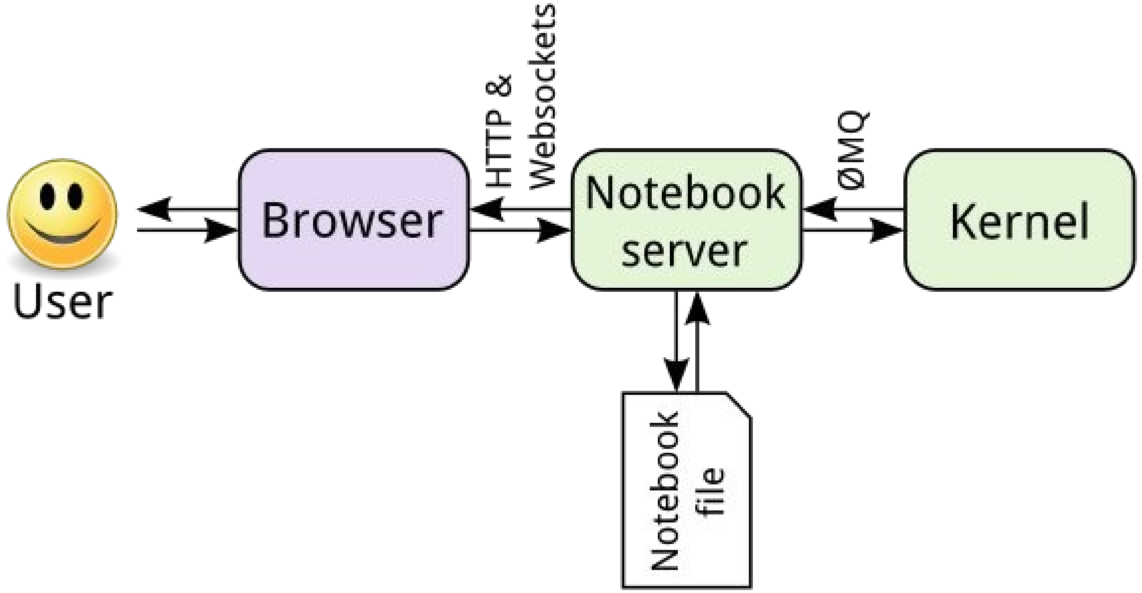
GRID2018, Dubna

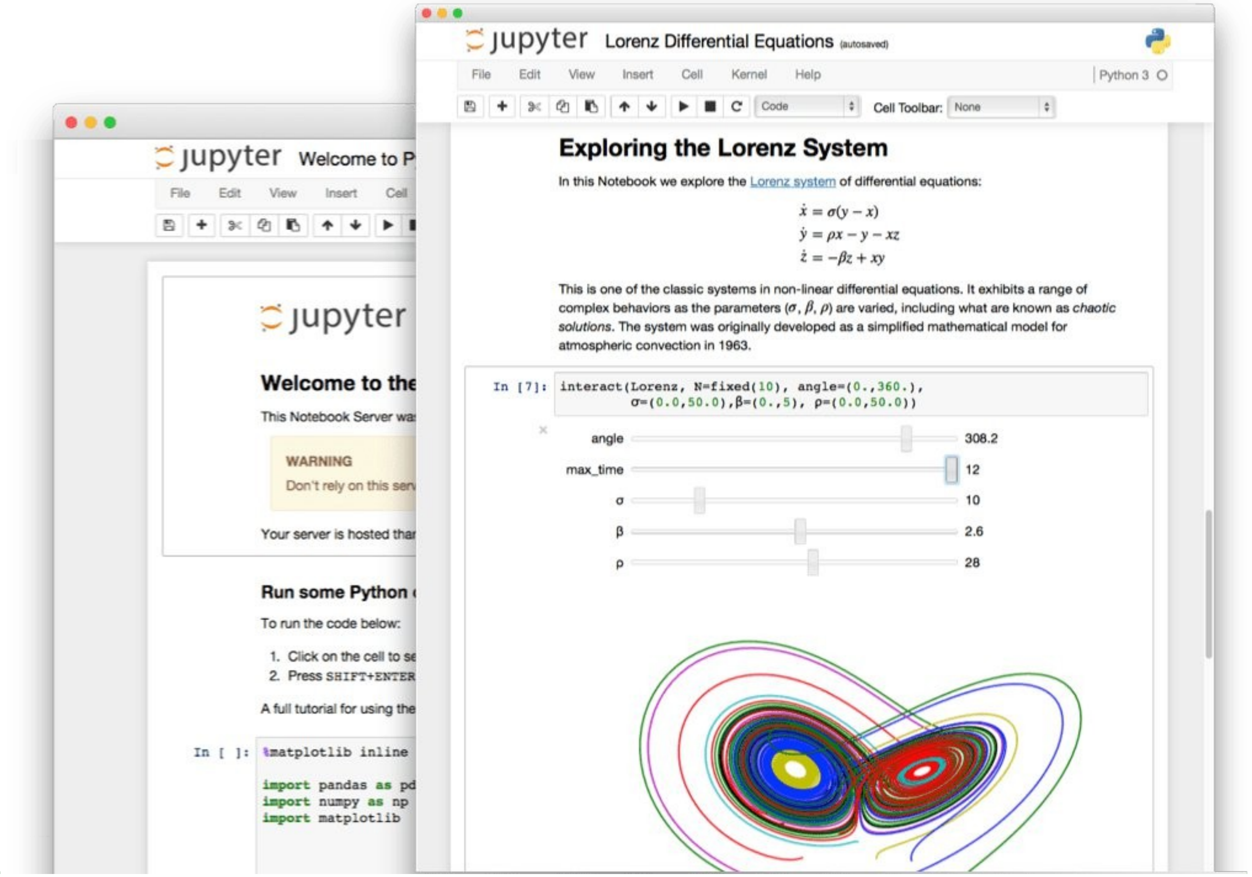
This work is supported by the Russian Science Foundation,
GRANT 17-72-20045.

Notebook and Notebook Server

Notebook:

- File format & kernel protocols
- Web application





jupyter

Welcome to the

This Notebook Server was

WARNING

Don't rely on this serv

Your server is hosted than

Run some Python c

To run the code below:

1. Click on the cell to se
2. Press SHIFT+ENTER

A full tutorial for using the

```
In [ ]: %matplotlib inline

        import pandas as pd
        import numpy as np
        import matplotlib
```

Exploring the Lorenz System

In this Notebook we explore the Lorenz system of differential equations:

$$\dot{x} = \sigma(y - x)$$
$$\dot{y} = \rho x - y - xz$$
$$\dot{z} = -\beta z + xy$$

This is one of the classic systems in non-linear differential equations. It exhibits a range of complex behaviors as the parameters (σ, β, ρ) are varied, including what are known as *chaotic solutions*. The system was originally developed as a simplified mathematical model for atmospheric convection in 1963.

```
In [7]: interact(Lorenz, N=fixed(10), angle=(0.,360.),
                 σ=(0.0,50.0),β=(0.,5), ρ=(0.0,50.0))
```

angle	308.2
max_time	12
σ	10
β	2.6
ρ	28

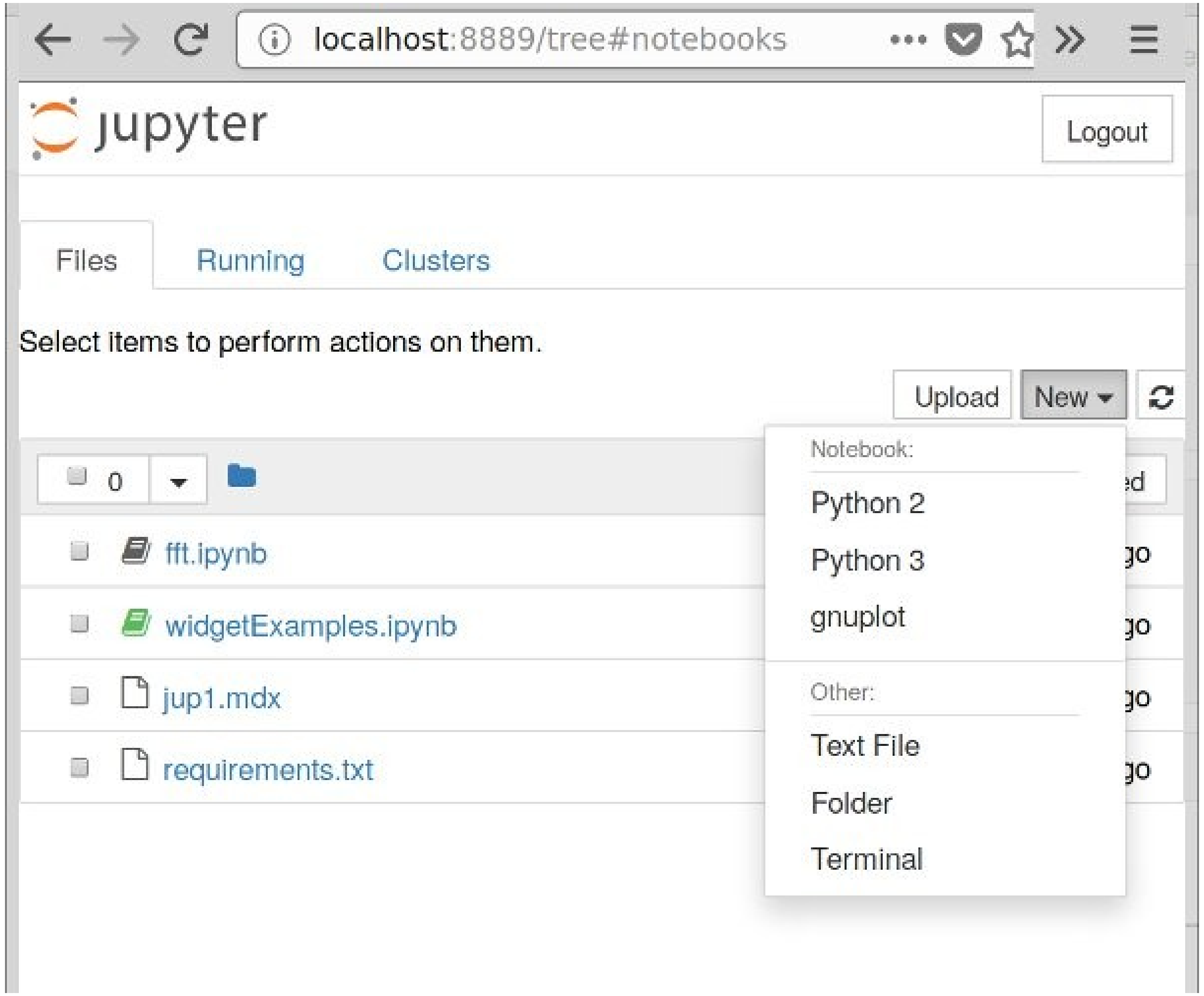
Notebook and Notebook Server

Notebook:

- File format & kernel protocols
- Web application

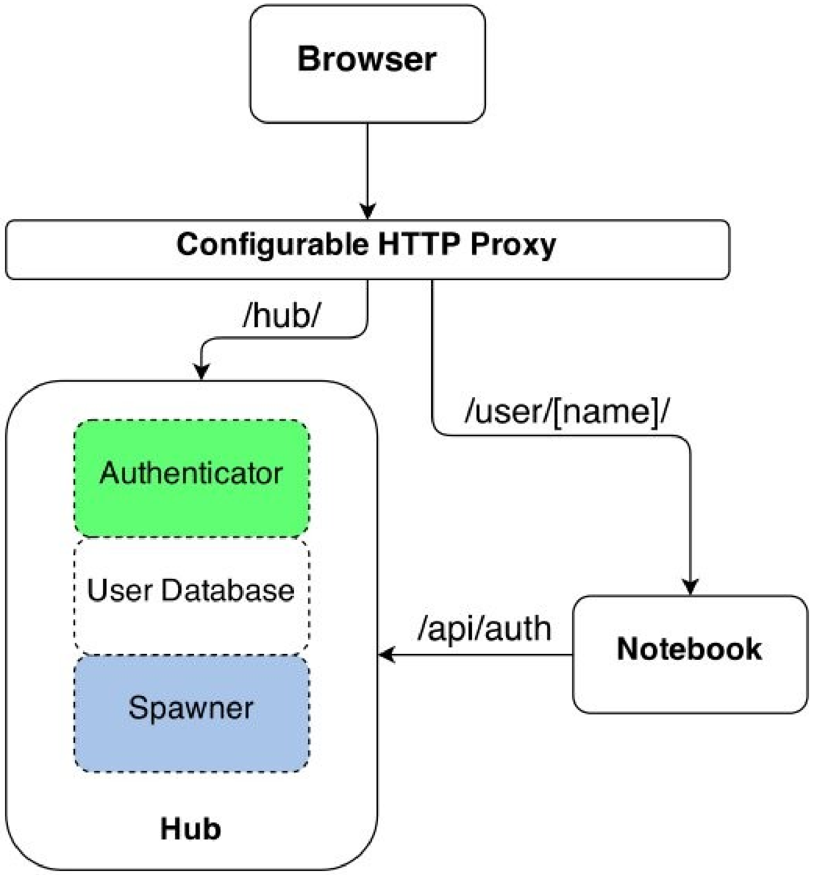
Single-user notebook server:

- Interface to manage files, notebooks, terminals



jupyterhub

- Sits behind a reverse proxy
- Manages authentication
- Spawns single-user Notebook servers
- Configures the proxy

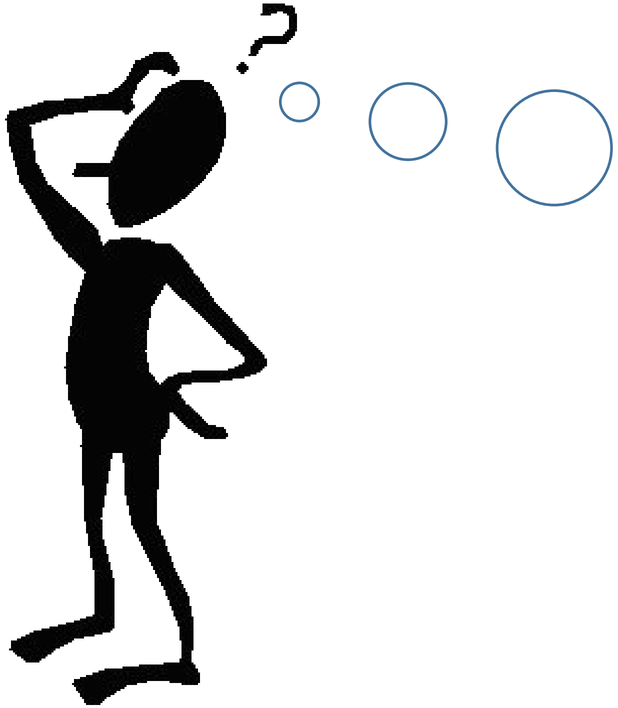


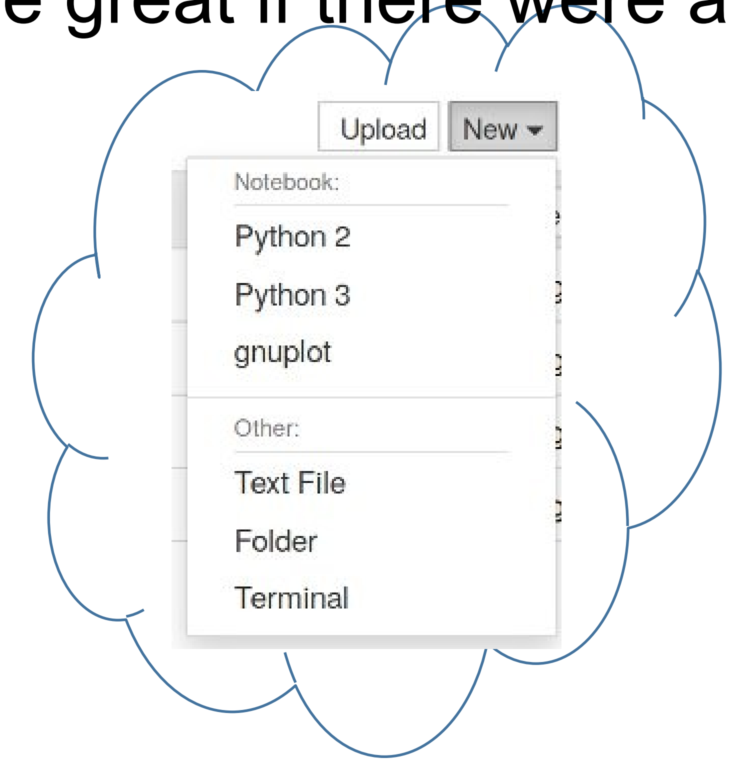
jupyterhub @ SPbSU

- Inspired by CERN SWAN
  store user-files in EOS
  load kernels & other software from CernVM File system
- Spawner: KubeSpawner
  spawns single-user notebook servers on our kubernetes cluster

Remote desktop

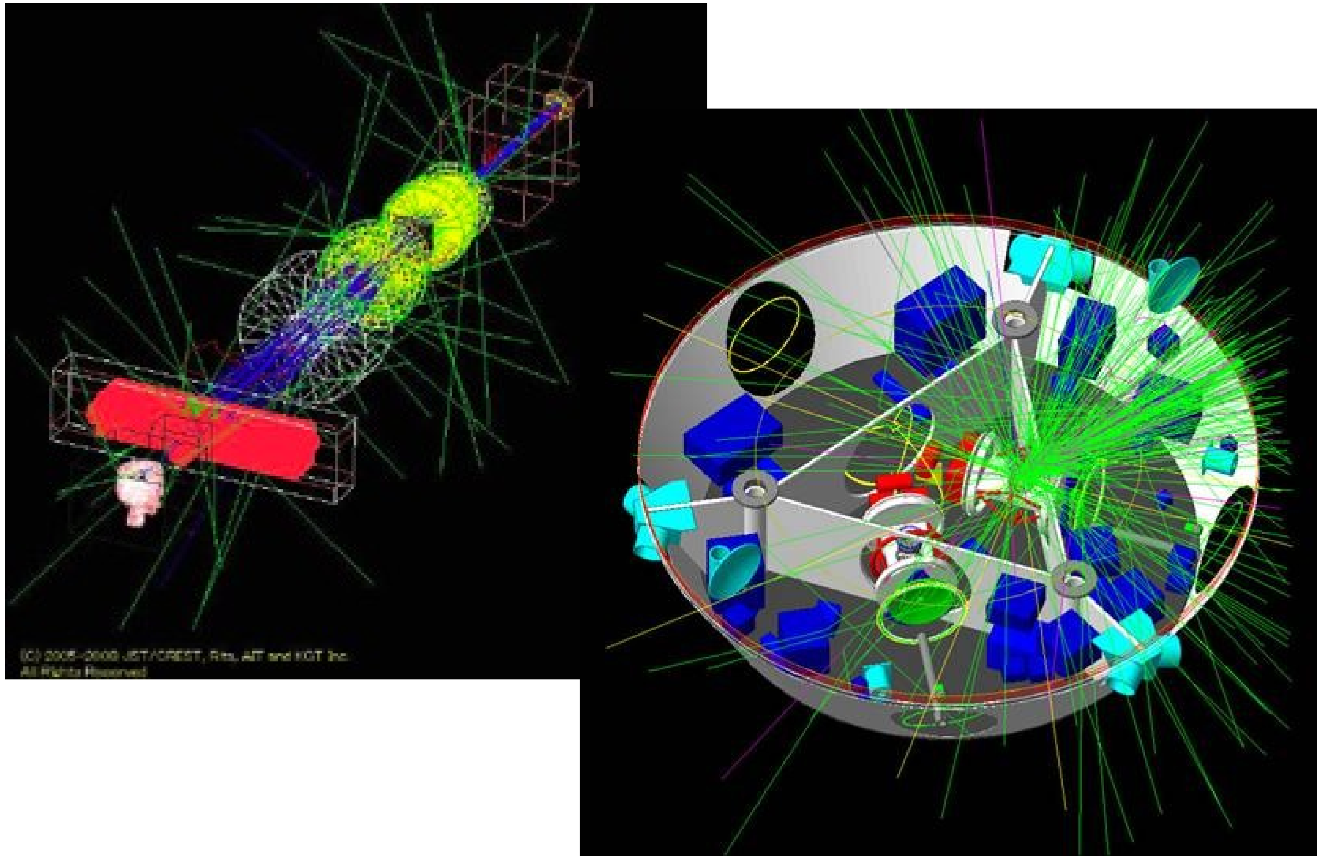
Once I thought that it would be great if there were a remote desktop in Jupyter…





Remote desktop

… so that people could use GEANT4, for example.

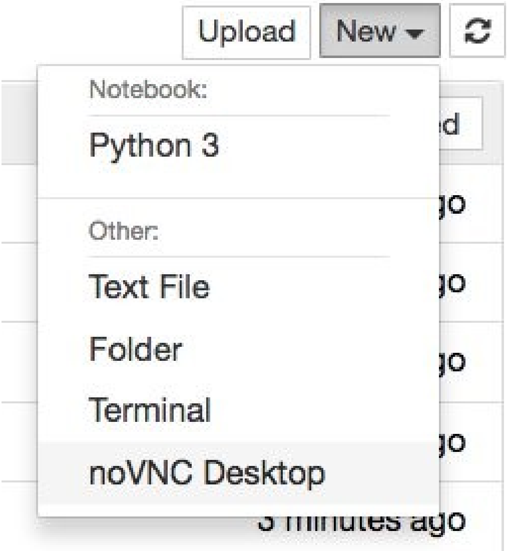


(C) 2005-2008 JST/CREST, Rits, AIT and KGT Inc.
All Rights Reserved

Remote desktop

I've googled a bit and found the **nbnovnc** project:

- adds noVNC Desktop to the Jupyter
- based on the **nbserverproxy** project



nbserverproxy: enables one to access arbitrary web-service running inside a single-user notebook server at `/user/[name]/proxy/[port]`

Remote desktop

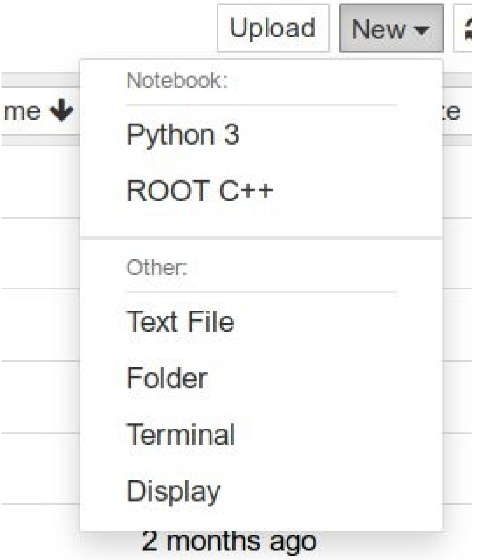
I've tried to proxy the Xpra HTML5 client and had to fix several 🐛 in both **Xpra** and **nbserverproxy**.

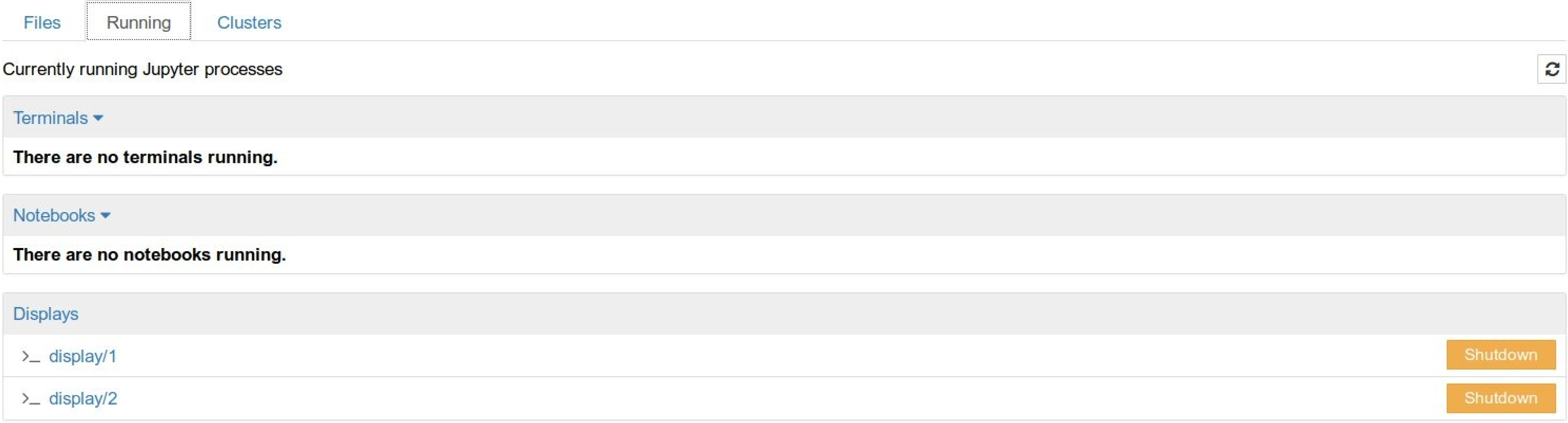
I ended up rewriting **nbserverproxy** to make it more flexible

Then I implemented a Jupyter plugin named **nbxpra**

nbxpra: jupyter + Xpra

- based on my «version» of **nbserverproxy**
- it is possible to spawn multiple displays





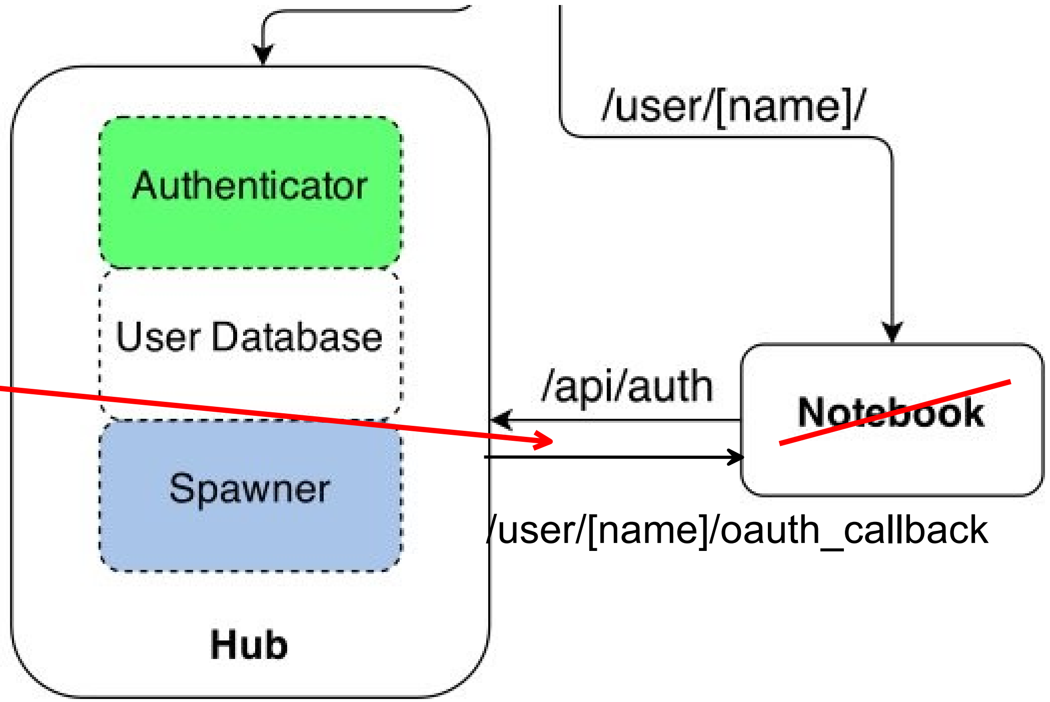
Currently running Jupyter processes

There are no terminals running.

There are no notebooks running.

jupyterhub abuse

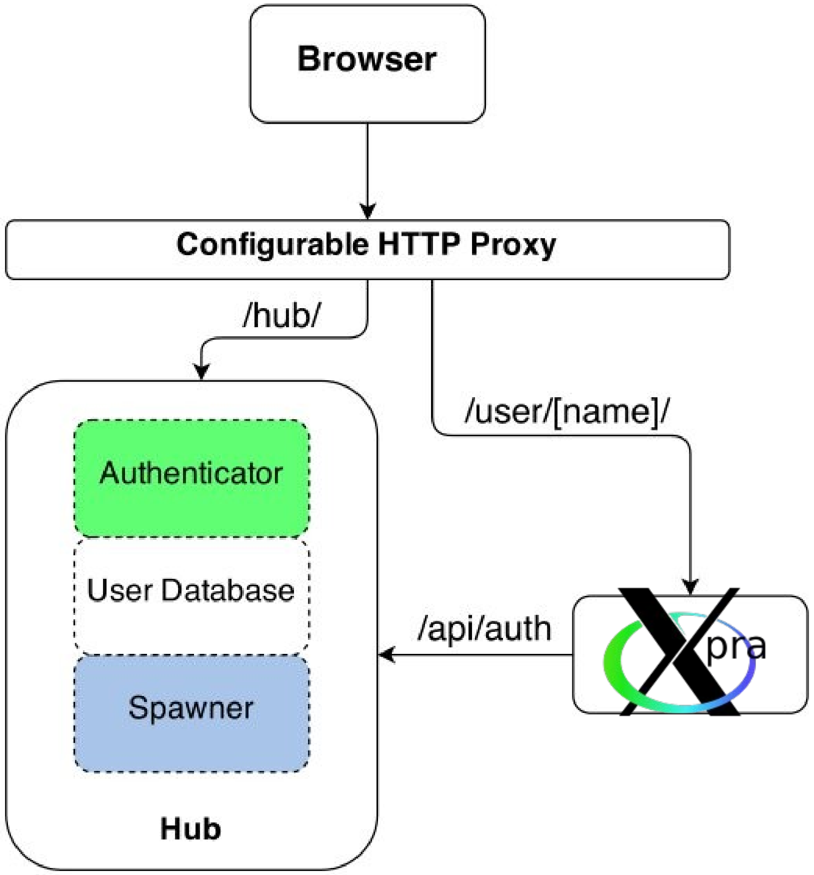
- jupyterhub has a lot of different **authenticators** and **spawners**
- Once you have a way to proxy a web-service, you don't really need a single-user notebook server anymore
- You want to be able to authenticate against the hub
- **jupyterhub** package provides the `HubOAuthenticated` mixin and the `HubOAuthCallbackHandler`



jupyterhub abuse

For example, one may spawn Xpra servers instead of single-user notebook servers.

I tried. There are some problems with Xpra HTML5 client keyboard mapping.


Browser
Configurable HTTP Proxy
/hub/
/user/[name]/
Authenticator
User Database
Spawner
Hub
/api/auth
Xpra